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(54) **Conveying shavings**

(57) A system for conveying metal shavings has a trough (1) located close to milling machines so that shavings therefrom are collected and transported by a feed screw (2, 3) arranged in the trough (1) to an outlet channel (21, 22) connected to a part (23) containing an emptying opening (24). A lip (11) extends parallel to, and the whole length of, the feed screw (2, 3) to prevent shavings from being wound around the feed screw (2, 3) and also to cut up any long shavings. As shown the system includes a disintegrator (4) followed by a second feed screw (6, 7).

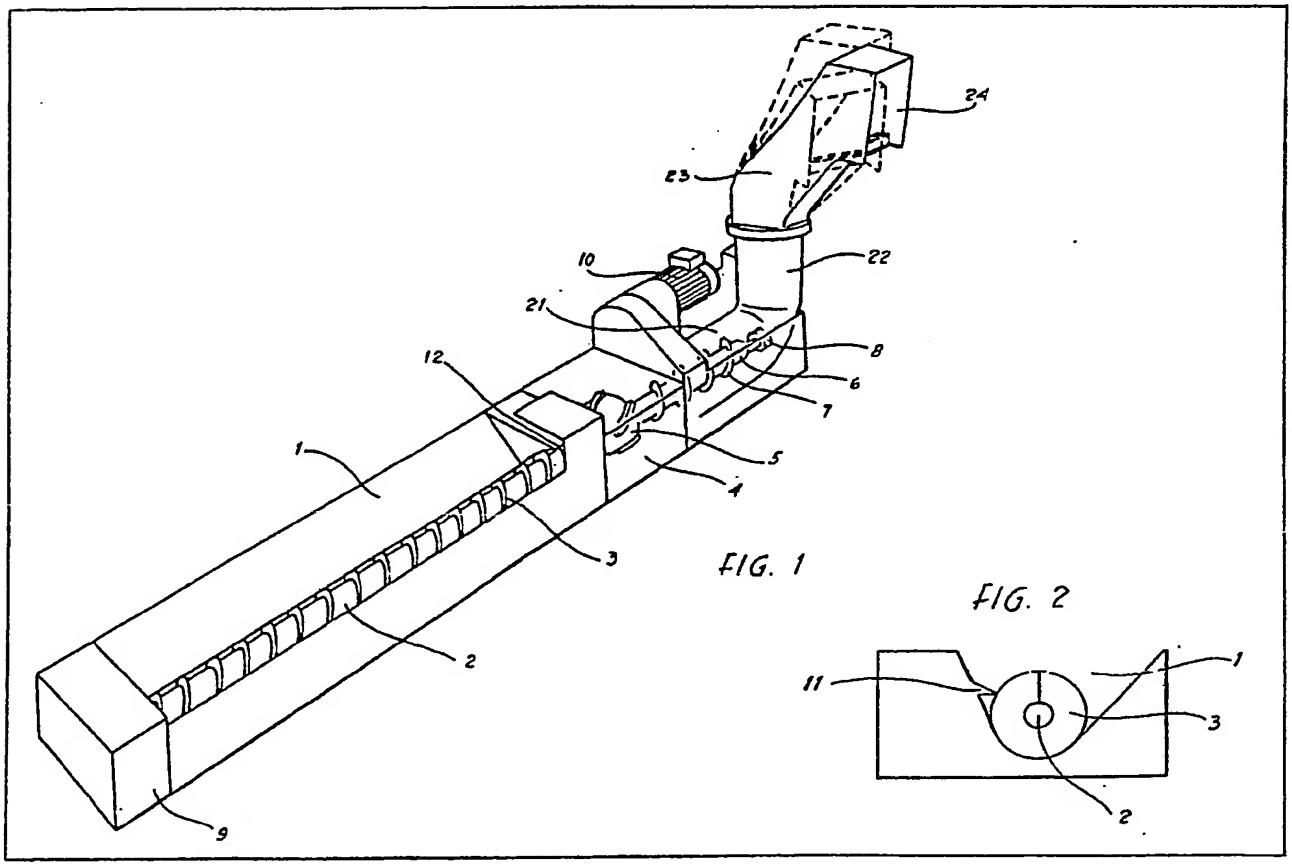

FIG. 1

FIG. 2

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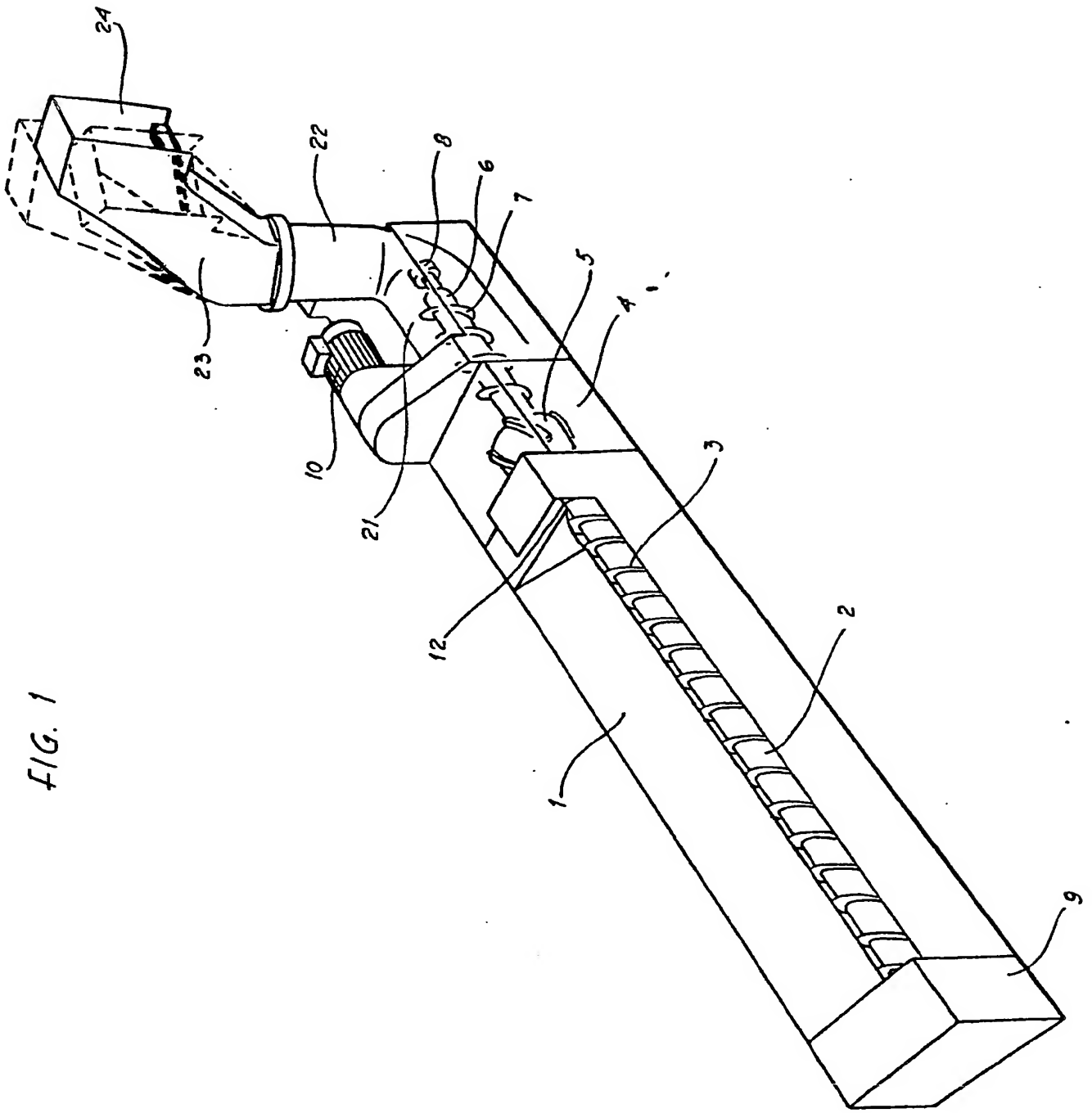

FIG. 1

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FIG. 2

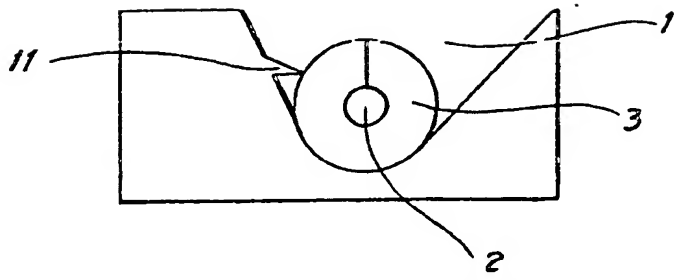
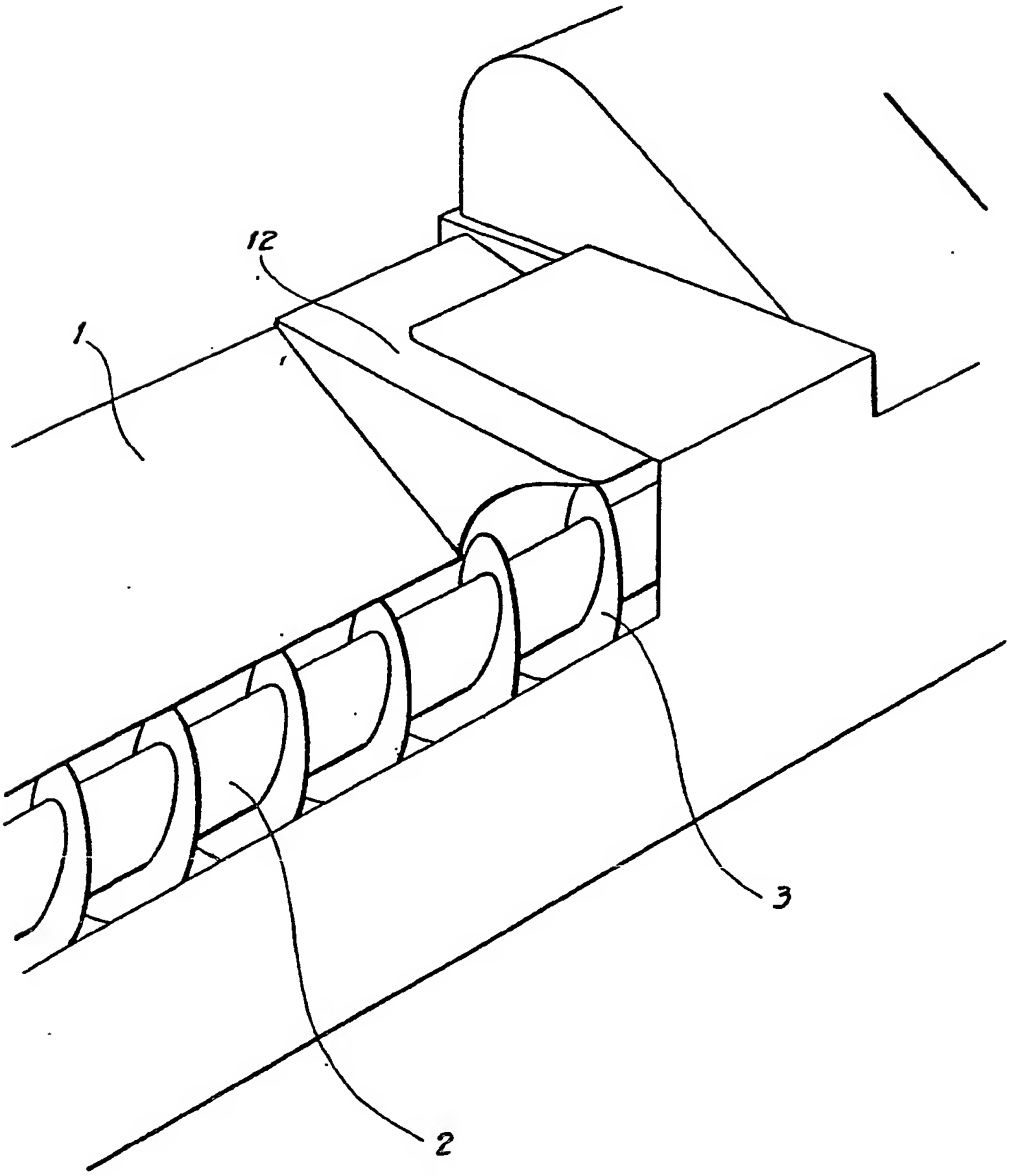


FIG. 3



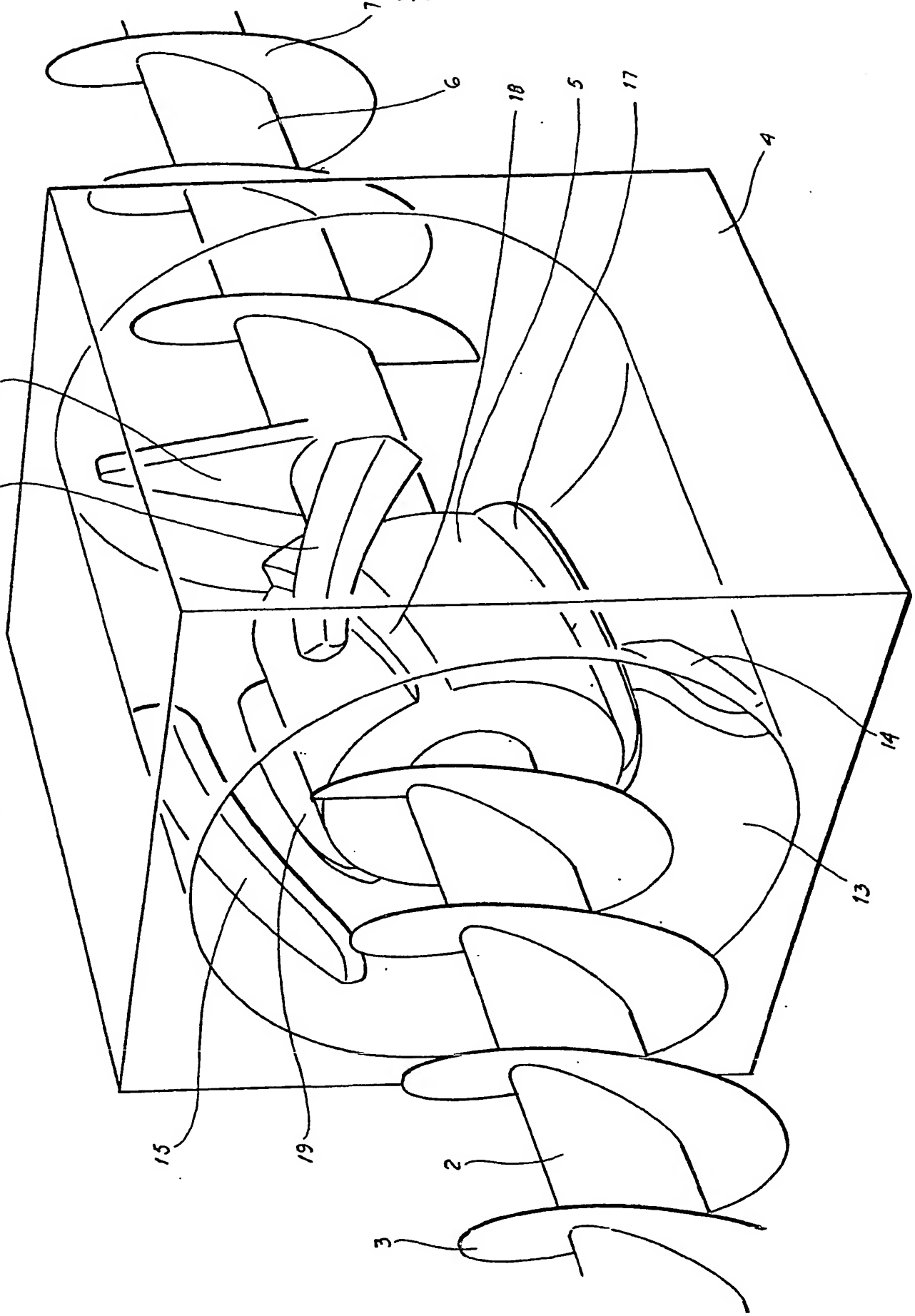


FIG. 4

SPECIFICATION
A conveyor system

The present invention relates to a conveyor system for transporting shavings from a milling machine to a collecting container.

The collection of shavings from milling machines can be performed in many ways. However, it has been found that the solutions applied so far are not economically justifiable in view of high labour costs.

The object of the present invention is therefore to provide a conveyor system which is simple, reliable and inexpensive in operation.

According to the present invention there is provided a conveyor system for transporting shavings from a milling machine to a collecting container, characterised by a collecting trough containing a feed screw provided with a helical flight cooperating with a projection extending parallel to, and being substantially the same length as the feed screw.

If several troughs are located one after the other, the shavings can be transferred from one trough to the next so that the last trough receives shavings from all the troughs as well as from milling machines it is placed beside.

The trough may include a passage at an outlet end hereof, into which passage the shavings are fed for further transport to an emptying opening.

The or each trough preferably has a lip or flange running longitudinally parallel to the feed-screw and directed inwardly, the lip or flange being in contact or almost in contact with the edge of the feed screw. The lip or flange is substantially the same length as the feed screw and has the function of preventing shavings from becoming wound around the feed screw. The function of the lip or flange is also to cut up any long shavings.

The passage is preferably conical, becoming narrower from the outlet.

The conveyor system may comprise a further passage, one end of which is connected to the first mentioned passage and the other end of which is provided with an emptying opening.

The further passage may comprise two parts, one part including the emptying opening and being rotatable so that the emptying direction can be selected as desired.

Upstream of the outlet and of the first mentioned passage it is preferable to arrange a cover for the trough so that the shavings being fed along are guided safely into said first mentioned passage. The inwardly directed lip or flange is preferably omitted in the trough at the region of the cover.

The conveyor system may comprise a disintegrator, such as a grinder, through which the shavings may pass for disintegration.

The disintegrator is preferably placed between the two conical passages.

An additional feed screw may be located downstream of the disintegrator so that the disintegrated shavings are assisted on their way.

A scraper or other means to eliminate clogging of the shavings after passage through the disintegrator may be placed downstream of the disintegrator, preferably on a shaft of the additional feed screw.

Means may be provided to collect and utilise any liquid released from the shavings.

One embodiment of the present invention will be described by way of example and with reference to the accompanying three sheets of drawings, in which

Fig. 1 shows a compact conveyor system

Fig. 2 shows a cross-section of the trough in the compact conveyor system,

Fig. 3 shows an enlargement of the compact conveyor system at its feed-out end and

Fig. 4 shows a disintegrator.

In the drawings 1 is a trough. At the bottom of the trough is a feed screw having a shaft 2 and flange 3. The cross-section of the trough can be seen clearly in Figure 2. The trough has an inwardly directed lip or flange 11 which abuts or almost abuts the edge of the feed-screw flange. The lip 11 extends along the entire length of the trough, as can be clearly seen in Figure 1. At the right-hand of the trough is a distintegrator 4 or grinder with a head 5. The distintegrator is followed by a passage 21 containing a shaft 6 with flange 7, said shaft and flange forming a second feed screw. The shaft has a bearing 8 at its righthand end and is journalled in one way or another at its lefthand end. Of course, the shaft 2, shaft 6 and shaft for the head of the distintegrator may be common, in which case it may be advisable to have suitable support and journalling members between the ends of the shafts. The shaft 2 is journalled at its lefthand end in a housing 9. A motor 10 is provided for the shaft 2 and drives the shaft 2 in the housing 9 via a transmission, not shown.

The passage 21 continues into an upwardly directed passage section 22. The passage 21, with the part 22, may increase in cross-section in the direction away from the distintegrator 4. A part 23 with an emptying opening 24 is rotatably connected to the passage part 22.

The lip 11 ends just before a cover 12 provided to press in the shavings fed forward by the feed screws 2 and 3. The cover is provided on the inside with members to break up long shavings. From the trough the shavings are fed into a conical passage, not shown, which is arranged in front of the disintegrator 4 and which becomes narrower towards the disintegrator 4. The trough 1, disintegrator 4 and said passage 21 may all be provided with outlets for liquid released by the shavings.

As mentioned before, the disintegrator itself comprises a head 5 which is preferably purely cylindrical and provided on its surface with a number of flanges 17, 18 and 19 arranged helically. Alternatively, the flanges may be in the form of cams. The head with flanges is arranged in a preferably parallel-epipedic body 4 having a through hole 13 forming a cylindrical space and provided on its walls with flanges or cams 14, 15

and 16. These flanges are also helical and cooperate with the flanges 17, 18 and 19. Shavings fed into the disintegrator are disintegrated by said flanges. At the feed-out end of the disintegrator a scraper 20 is arranged on the shaft 6. This faces radially outwards and has the taks of preventing clogging of the disintegrated shavings at the feed-out end. It may be advisable to arrange a scraper at the feed-in end as well.

The compact conveyor system described above functions as follows. It is imagined that the compact conveyor system shown in Figure 1 is placed by a number of milling machines so that shavings from these machines fall automatically down into the trough 1. The shavings are fed along by the rotating screws 2 and 3 and the shavings are prevented by the lip 11 from becoming wound around the shaft 2 during their passage. The lip also offers the advantage that any long shavings are broken up. When the shavings reach the cover 12 they are radially restricted from above also, thus facilitating feeding into the following conical passage. The cover may include members to further disintegrate long shavings. After this the shavings are passed to the disintegrator 4 where they are ground to very small particles and passed on to the passage 21 with connection 22. The disintegrated shavings can generally move along the passage 21 and its connecting part 22 without assistance. However, it is advisable to have the second feed screw with shaft 6 and flange 7 to facilitate the flow. The shaft 7 is provided with a scraper 20, as mentioned earlier, which has the function of preventing clogging of the passage 21 by pulverized shavings coming from the disintegrator 4. The pulverized shavings are carried to the rotatable part 23 which is provided with an emptying opening 24. The rotatable part 23 can be set by suitable known means in a suitable direction for cooperation with a collecting container.

A compact conveyor system of the type shown in Figure 1, where the trough may vary in length, can be placed close to a group of machines. In certain cases it may be advisable to have a compact conveyor system according to Figure 1 where a number of troughs are arranged in series by groups of machines where shavings are passed from one trough to the next until they reach a compact conveyor system of the type shown in Figure 1. The transport of shavings from one trough to another can be achieved in a plurality of ways.

In the above only shavings are mentioned but it should be obvious that it is metal shavings which are of primary concern here.

CLAIMS

1. A conveyor system for transporting shavings from a milling machine to a collecting container, characterised by a collecting trough containing a feed screw provided with a helical flight cooperating with a projection extending parallel to, and being substantially the same length as, the feed screw.

2. A conveyor system according to Claim 1, characterised in that one end of the trough is provided with an outlet connected to a conical passage, the cross-section of the passage decreasing in the direction away from the outlet.

3. A conveyor system according to Claim 2, characterised by a further passage one end of which is connected to the first mentioned passage and the other end of which is provided with an emptying opening.

4. A conveyor system according to Claim 3, characterised in that the further passage increases in cross-section from its connection to the first mentioned passage towards the emptying opening.

5. A conveyor system according to any one of Claims 2 to 4, characterised in that a disintegrator is located downstream of the outlet.

6. A conveyor system according to Claim 5, characterised in that the disintegrator is arranged between the first mentioned and the further passage.

7. A conveyor system according to Claim 5 or Claim 6 characterised in that the disintegrator comprises a central body, which is provided on its outer surface with outwardly directed flanges, and an outer body with an inner surface surrounding the central body, the inner surface being provided with inwardly directed flanges cooperating with the flanges of the central body.

8. A conveyor system according to Claim 7, characterised in that the central body is cylindrical.

9. A conveyor system according to Claim 7 or Claim 8, characterised in that the outwardly disected flanges are in the form of part of a helix.

10. A conveyor system according to any one of Claims 7 to 9, characterised in that the inner surface is cylindrical.

11. A conveyor system according to any one of Claims 7 to 10, characterised in that the inwardly disected flanges are in the form of part of a helix.

12. A conveyor system substantially as hereinbefore described with reference to the accompanying drawings.

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